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## (54) LANDING DOOR LOCK FOR LIFT SYSTEMS

(71) We, BENNIE LIFTS LIMITED, a British Company, of 16 Upper Grosvenor Street, London, W1Z 0BQ, and MICHAEL JOHN MOLYNEUX, a British Subject, of 16 Upper Grosvenor Street, London, W1X 0BQ, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to landing door locks for lift systems. More particularly, the invention relates to landing door locks having key operated auxiliary release mechanisms, and lift systems having such landing door locks.

In lift systems it is usual to provide the landing doors on each floor with a mechanically operated lock release mechanism which is actuated during the normal operation of the lift by a retractable cam mounted on the lift car or the landing door, but which also has an auxiliary release mechanism comprising a lever, which is actuable manually from outside the lift well by a key inserted through a hole in the landing door or adjacent thereto, e.g. in the architrave. This manual method of opening the door is primarily used for emergency purposes or by service engineers and in such a case the engineer actuates the landing door lock auxiliary release mechanism with a key and then opens the door manually.

However, it has become evident that a more satisfactory method is required to avoid the landing door being opened by unauthorized persons. This problem is particularly acute in the cases of lifts installed in blocks of flats or other buildings where children or vandals frequently open the landing doors employing articles other than the key. Such action allows the lift equipment to be damaged and risks serious injury or death to the person who gains access to the lift well.

According to the invention there is provided a landing door lock for a lift system in which a lift car is moved up and down a lift well, the lock having a main release mechanism to release the lock during nor-

mal operation of the lift system and an auxiliary release mechanism comprising a lever which is actuable by a key to operate the auxiliary release mechanism when the lock is mounted with the lever adjacent a key hole in the door or adjacent thereto through which the key, in use, is inserted to actuate the lever, the lock including at least one fixed obstruction intended to prevent objects other than the key from being inserted through the key hole and actuating the lever.

Preferably the obstruction or combination of obstructions are constructed to prevent any object including the key from being inserted along a direct path between the key hole and the lever. The key thereby has to be inserted along a non-direct path, whereafter the key, but not any other object, may actuate the lever.

In one embodiment of the invention the or each obstruction comprises a projection protruding part way across an aperture in a respective plate, the key, in use, being inserted through the or each said aperture to operate the auxiliary release mechanism.

In another embodiment of the invention the or each obstruction is a non-circular aperture in a respective plate through which aperture the key is inserted for actuation of the lever.

It will be appreciated that the invention constitutes the provision of a security device which is applicable both to new lift systems and to modifications of existing lift systems. In an existing system having the necessary landing door release mechanism, the system may be modified by, for example, fixing one or more plates in a selected position between the key hole and the lever of the auxiliary release mechanism and supplying an appropriate new key.

The invention still further provides a lift system having a landing door lock as described above.

By way of example, specific embodiments in accordance with the invention will be described with reference to the accompanying drawings in which:—

Figure 1 is a front elevation of part of a landing door for a lift well, the figure illus-

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trating the key hole in the door for reception of a specially designed key to actuate a lock auxiliary release mechanism for the door;

5 Figure 2 is a section through the part of the door shown in Figure 1;

Figure 3 is a diagrammatic plan view of the key inserted into the key hole.

10 Figure 4 is a similar view to Figure 3 showing the key after actuation of the lever of the auxiliary release mechanism;

Figure 5 is an elevation of a plate attachment for the door providing an obstruction to actuation of the lever;

15 Figure 6 is an end elevation of the plate attachment;

Figure 7 and 8 are elevational views of the key;

20 Figure 9 is a section along the line 9—9 in Figure 7;

Figure 10 is a diagrammatic plan view of a second embodiment;

25 Figures 11 and 12 are diagrammatic sectional and elevational views of a third embodiment;

Figures 13, 14 and 15 are diagrammatic plan views of a fourth embodiment;

30 Figures 16 and 17 are similar views to Figures 1 and 2 of a fifth embodiment;

Figure 18 is an elevation of the operative part of the key of the fifth embodiment;

35 Figure 19 is a section along line 19—19 in Figure 18;

Figures 20 and 21 are similar views to Figures 1 and 2 of a sixth embodiment, Figure 21 showing the specially designed key inserted to actuate the auxiliary release mechanism;

40 Figure 22 shows a modified key to actuate the auxiliary release mechanism of the embodiment of Figures 20 and 21;

Figures 23 and 24 are similar views to Figures 20 and 21 of a seventh embodiment; and

45 Figures 25 and 26 are again similar views to Figures 20 and 21 of an eighth embodiment.

50 These embodiments concern a lift system in which one or more landing doors for the lift well each has a mechanically operated lock auxiliary release mechanism which is key operated. Referring to Figures 1 to 4 there is shown a landing door 20 having an outer surface 21 and an inner surface 22 with respect to the lift well. In the outer surface 21 of the door is a circular hole 23 revealing a C-shaped key hole 24 in a vertical wall 25 of a box 26 set into the door from the inside and clamped to the inner surface 22 of the door by rivets 27.

60 This key hole 24 permits a specially shaped key 28 (Figures 7 to 9) to be inserted through the key hole from the outside and to actuate a lever 29 to release the lock assembly (not shown) of the door. In this

embodiment, the lever is actuated to release the lock assembly by movement of the lever laterally with respect to the key hole, Figures 3 and 4 showing the extreme positions of the key 28 before and after actuation of the lever respectively. The free end of the lever is tapered to provide a knife edge contact with the key 28.

70 As shown in Figures 7 to 9, the key 28 has an operative end 30 of channel cross-section of corresponding size and shape to the key hole 24. The key may thereby be inserted through the key hole towards the lever 29 and thereafter actuate the lever by pivotal action between the extreme positions shown in Figures 3 and 4. However, to prevent other similar objects, i.e. lengths of channel, being used to actuate the lever, for example, by unauthorized persons, the specially shaped key is provided with an aperture 31 and there is provided a plate attachment 32 which is fitted to the box 26 and has a rigid projection 33 designed to pass through the aperture 31 of the key 28 during use of the key to actuate the lever and also to form an obstruction to any other object which a person may attempt to use for this purpose.

75 In addition, at least in this embodiment, the projection 33 has a surface area as viewed from the key hole 24 which is larger than the equivalent surface area of the lever, and also extends further to the left as seen in Figure 1 than the lever. Hence it is not possible to insert any object, including the key 28, directly through the key hole towards the lever and thereafter actuate the lever. Instead it is necessary to insert the key at an angle past the free end of the projection 33, the key then being able to actuate the lever.

80 Furthermore, it is believed that any unauthorized person, knowing the usual kind of auxiliary release mechanism, may consider that the projection 33 is in fact the lever 29.

85 Referring to Figures 5 and 6, the plate attachment is conveniently formed by folding the plate 32 to provide an upstanding crease line 34 and then pressing out an aperture 35 defining the projection 33 which is integral with the plate. In addition the convex surface of the projection which it is intended should be nearest the key hole is rounded for the purpose of further inhibiting actuation of the lever by an object other than the key.

90 If desired, the aperture 31 in the key may be replaced by a notch, recess or the like in the key. Also, the plate attachment may be fitted in different ways and there may be provided two or more plate attachments fitted to the box 26 one behind the other with respect to the key hole and each providing an obstruction for engagement with an aperture or notch in the key. Alter- 130

natively, a single plate attachment may have two obstructions, one extending horizontally and the other vertically, or both extending horizontally but in opposite directions as described below with regard to Figures 13 to 15.

Figure 10 illustrates a second embodiment in which the principle of the plate attachment 32 providing a projection 33 is applied to a construction in which a square-ended key 40 pushes the lever 41 to release the lock assembly of the door 42. For this purpose the aperture 43 in the key is longer to allow the necessary longitudinal movement of the key after it has been inserted into the key hole and the projection has engaged the aperture.

A third embodiment is illustrated in Figures 11 and 12. In this embodiment, a key 50 has a drop down end 51 for engagement with a lever 52 in a different horizontal plane from the key hole 53, the key being rotated to move the lever laterally with respect to the key hole to release the lock assembly of the door. Extending parallel to the lever 52 is a rigid projection 54 mounted in fixed relation with the key hole for engagement in an aperture 55 in the operative end 51 of the key to allow the key to actuate the lever.

Figures 13 to 15 illustrate a fourth embodiment which is similar to the embodiment of Figures 1 to 4 in that the box 26 has a plate attachment 32 having the projection 33 designed to pass through the aperture of a key during use of the key to actuate the lever 29 to release the lock assembly of the door. However, in this embodiment, the box 26 also provides a second projection 60 which is spaced in front of the projection 33 and extends in the opposite direction, i.e. its free end leads in the direction of movement of the lever to release the lock assembly of the door. This means that the aperture 61 of a key 62 (which aperture 61 is longer than the equivalent aperture 31 of the key 28) receives the second projection during insertion of the key and the first projection during use of the key to actuate the lever. There is thus provided a double barrier to minimise the chance of the lock assembly being released by unauthorized persons. Moreover, the initial insertion of the key has to be in the opposite direction from that which is required to engage the lever, i.e. to the right of the projection 60 as viewed in Figure 13 instead of to the left.

If desired the second projection 60 may be attached to or integral with the plate attachment providing the first projection 33, instead of being attached to the box 26.

In each of the four embodiments described above, the key may be C-shaped (as in the embodiments of Figures 1 to 10 and 13 to 15) or still generally channel shaped but

having another cross-section, for example, U, V or L-shaped. Alternatively, the key may comprise a rod or bar, and in this case the key may have a notch formed by providing the rod or bar with a set, recess or the like for reception of the projection and transverse to the length of the key.

In a fifth embodiment (Figures 16 to 19) the key 70 has a shank 71 of circular cross-section and a flag-like projection 72 for insertion through a correspondingly shaped key hole 73 to actuate a release lever 74. The key hole 73 is provided in a plate 75 and is visible externally of the door 76. However, behind the plate 75 are three further plates 77, 78 and 79 each with its own key hole of the same shape but with the respective slot opening 80 for reception of the projection 72 displaced by 90° from the slot openings in the adjacent plate or plates. Thereby for the key to be inserted and to be capable of activating the release lever 74, the key has to be rotated through 90° three separate times in order to pass through each inner plate, 77, 78 and 79 in turn. Of course, it will be appreciated that the angle of displacement between the slot openings 80 in adjacent plates 75, 77, 78 and 79 may be changed as desired, and so may the number of plates provided.

Figures 20 and 21 illustrate a sixth embodiment in which the key hole 81 is provided in a first obstruction plate 82 behind which there is a second obstruction plate 83 having a second key hole 84. The two key holes 81, 84 are of the same preselected shape, which in this embodiment is triangular, and aligned with each other. The key holes are also aligned with a triangular socket in a release lever 85 whereby a triangular key 86 may be inserted through the two key holes and then engaged in the socket. If desired, the triangular key holes and socket may be concentric but not aligned, for example so that the key has to be rotated before it can be passed through the second key hole 84 and/or engaged in the socket. In order that the key can be rotated which action in this embodiment is necessary to actuate the release lever 85, the key 86 has first and second peripheral grooves 87, 88 which are aligned with the first and second obstruction plates 82, 83 respectively when the key is engaged in the socket.

Figure 22 shows a modified form of key 89 which could be used instead of the key 86, the modified key 89 having only a short end portion 90 of triangular cross-section. The remainder or shank 91 of the key 89 is cylindrical and of such a diameter that it can be rotated within the key holes 81, 84 when the end portion 90 is engaged in the socket in the release lever 85. The shank 91 may, of course, have a cross-section which is

other than circular provided that the key may still be rotated within the key holes.

The key holes, the socket and the correspondingly shaped key may, of course, have any other regular or irregular non-circular geometric shape, besides being triangular.

Figures 23 and 24 illustrate a seventh embodiment which is substantially the same as the sixth embodiment having the modified form of key 89 shown in Figure 22, except that rotation of a release lever 94 is achieved by a further modified key 92 having a recess 99 of non-circular cross-section, which in this embodiment is triangular, in its operative end portion 95, for engagement with a correspondingly shaped spigot 93 on the release lever. The key thereby acts in the manner of a box-spanner.

As may be seen from Figure 23, the triangular shaped key hole 96 is aligned with the triangular shaped spigot 93 on the release lever but displaced angularly relative to the intermediate triangular shaped aperture 97 in the plate 98 through which the key has to be passed before the key can be engaged with the spigot to actuate the release lever. Alternatively, the aperture 96 and the key hole 97 may be aligned with each other but angularly displaced relative to the spigot 93.

An eighth embodiment is shown in Figures 25 and 26. This embodiment is very similar to the seventh embodiment and again employs a key 100 having an end recess or socket 101 of non-circular cross-section for engagement with a correspondingly shaped spigot 102 as a release lever 103. As before, the socket 101 and the spigot 102 are conveniently of triangular cross-section. However, in this embodiment the external cross-section of the operative end 104 of the key is basically circular, the operative end having longitudinal grooves 105, e.g., six, spaced around its periphery for engagement with a corresponding number of splines 106 projecting internally of both a circular key hole 107 and a circular aperture 108 intermediate the key hole and the aperture non-circular. As in the case of the previous embodiment the splines 106 of the aperture 108 may be aligned with or angularly displaced with respect to the splines of the key hole 107. The latter case is preferred so that the key has to be rotated in between its insertion through the key hole 107 and the aperture 108. The key may also have to be rotated again before its socket 101 can be engaged with the spigot 102.

If desired, the keys 92 and 100 instead of having a shank of reduced cross-section in the manner of the key 89 shown in Figure 22, may have axially displaced peripheral grooves in the manner of the key 86 shown in Figure 21.

Also, each of the embodiments shown in

Figures 20 to 26 may be modified by being provided with two or more apertures intermediate the key hole and the release lever, for example in a manner similar to the embodiment of Figures 16 to 19.

Although the key hole has been described in each embodiment as being provided in the respective landing door, the key hole may be provided adjacent the landing door, for example in the architrave of the door opening or even the structure defining the lift well. In this case the plate attachment or attachments would still be mounted in fixed relation to the key hole but not, of course, to the landing door itself.

#### WHAT WE CLAIM IS:—

1. A landing door lock for a lift system in which a lift car is moved up and down a lift well, the lock having a main release mechanism to release the lock during normal operation of the lift system and an auxiliary release mechanism comprising a lever which is actuable by a key to operate the auxiliary release mechanism when the lock is mounted with the lever adjacent a key hole in the door or adjacent thereto through which the key, in use, is inserted to actuate the lever, the lock including at least one fixed obstruction intended to prevent objects other than the key from being inserted through the key hole and actuating the lever.

2. A landing door lock as claimed in claim 1, wherein the obstruction or combination of obstructions are constructed to prevent any object including the key from being inserted along a direct path between the key hole and the lever.

3. A landing door lock as claimed in claim 1 or claim 2, wherein the or each obstruction comprises a projection protruding part way across an aperture in a respective plate, the key, in use, being inserted through the or each said aperture to operate the auxiliary release mechanism.

4. A landing door lock as claimed in claim 3, wherein the or each projection is formed integrally with the respective plate.

5. A landing door lock as claimed in claim 3 or claim 4, wherein the lever extends parallel in the or each projection and is movable longitudinally by the key to operate the auxiliary release mechanism, the free end of the or each projection leading in the direction of said movement of the lever to operate the auxiliary release mechanism and capable of passing through an aperture, notch or the like in the key, during actuation of the lever.

6. A landing door lock as claimed in claim 5, including two said obstructions, one for reception in an aperture, notch or the like in the key during insertion of the key and the other for reception in an aperture, notch or the like in the key during use of the key to actuate the lever.

7. A landing door lock as claimed in claim 5, wherein there is provided a simple obstruction, the surface area of the obstruction facing the lever being larger than the corresponding surface area of the lever facing the obstruction.
8. A landing door lock as claimed in any one of the preceding claims including a key for actuating the lever, the key having a longitudinal cross-section which is generally channel shaped, and at least one aperture, notch or the like for reception of the or each projection during insertion of the key and/or during use of the key to actuate the lever.
9. A landing door lock as claimed in claim 8, wherein the cross-section of the key is C, U, V or L-shaped.
10. A landing door lock as claimed in claim 8, wherein the key comprises a rod or bar and is provided with at least one set, recess or the like extending transverse to and along part of the length of the bar or rod and acting as a notch for reception of the or each projection.
11. A landing door lock as claimed in claim 1, wherein the or each obstruction is a non-circular aperture in a respective plate through which aperture the key is inserted for actuation of the lever.
12. A landing door lock as claimed in claim 11, wherein the or each plate is disposed so that, in use, the key has to be rotated before it can be passed through the aperture in the plate.
13. A landing door lock as claimed in claim 11 or claim 12, wherein there are three said plates positioned successively one behind each other, and the aperture in each plate is not aligned with the aperture in the or each adjacent plate.
14. A landing door lock as claimed in any one of claims 11 to 13, wherein, in use, the key is rotated to operate the auxiliary release mechanism.
15. A landing door lock as claimed in claim 14, wherein the lever has a non-circular socket for reception of the key whereby the key may be engaged in the socket and then rotated to actuate the lever.
16. A landing door lock as claimed in claim 14, wherein the lever has a non-circular spigot for insertion in a correspondingly shaped socket in the key.
17. A landing door lock as claimed in any one of claims 14 to 16, including a key for actuating the lever, the key having a peripheral groove associated with the or each plate and alignable therewith when the key is inserted for actuation of the lever.
18. A landing door lock as claimed in any one of claims 14 to 16, wherein the key has a shank having a short operative end portion which can pass through the non-circular aperture in the or each plate but is not rotatable therein, the remainder of the shank being of smaller cross-section and rotatable in the non-circular aperture in the or each plate.
19. A landing door lock for a lift system substantially as hereinbefore described with reference to and as shown in the accompanying drawings.
20. A lift system having a landing door lock as claimed in any one of the preceding claims.

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Fig. 1.

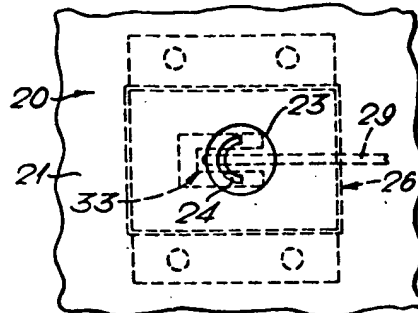


Fig. 2.

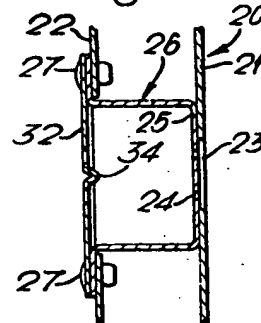


Fig. 3.

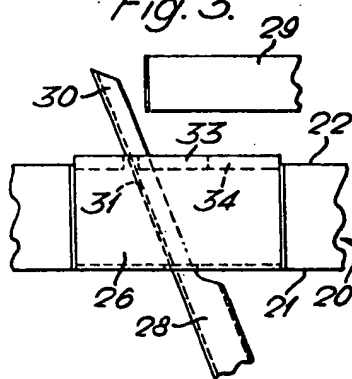


Fig. 4.

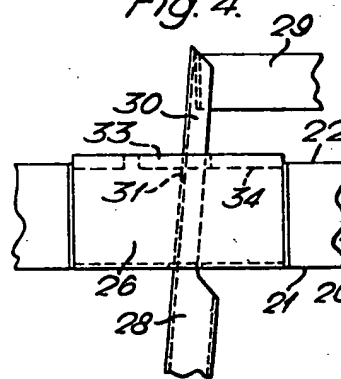
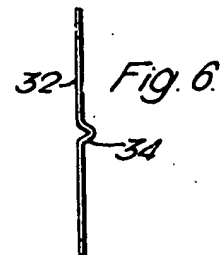
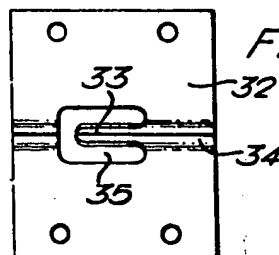


Fig. 5.

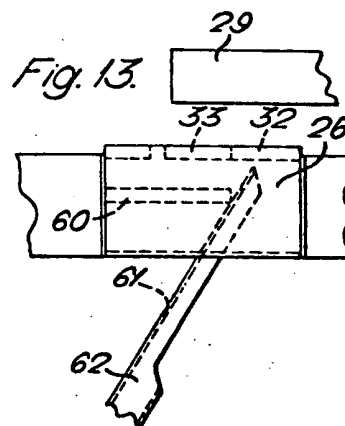
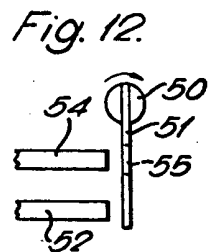
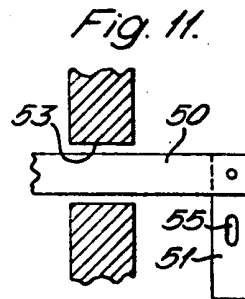
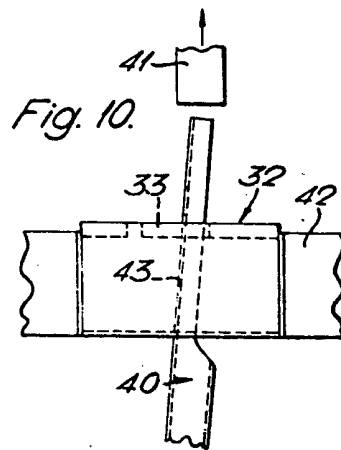
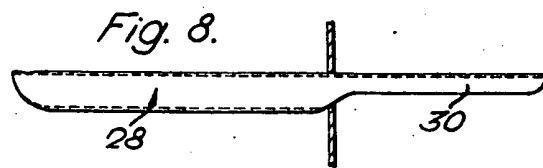
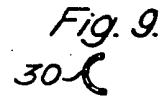
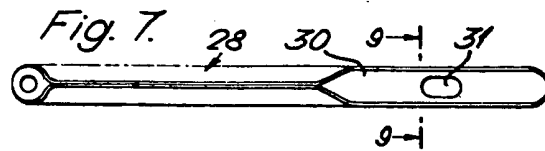


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Fig. 14.

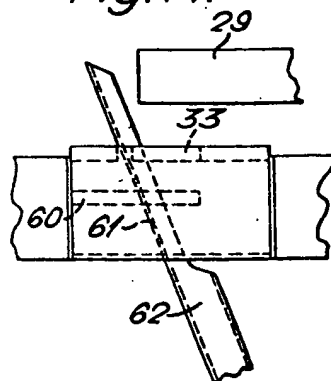


Fig. 15.

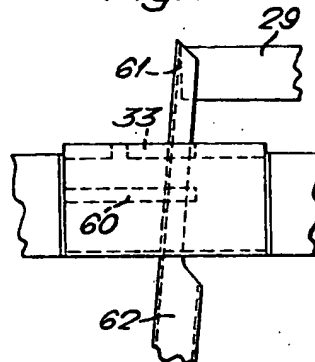


Fig. 16.

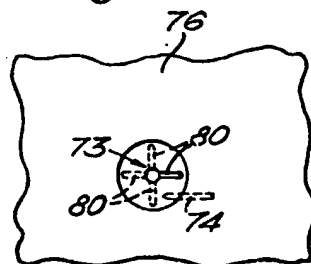


Fig. 17.

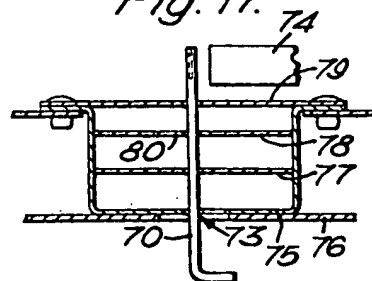


Fig. 18.

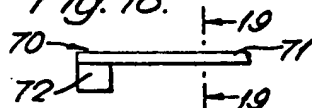


Fig. 19.



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Fig. 20.

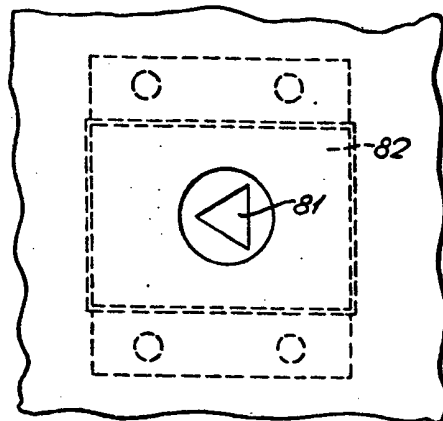


Fig. 21.

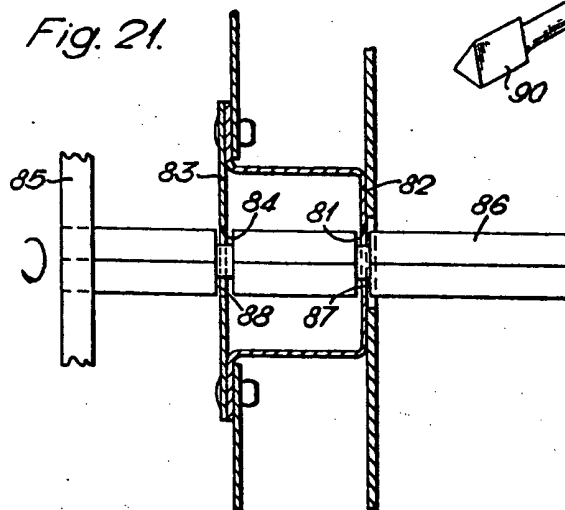
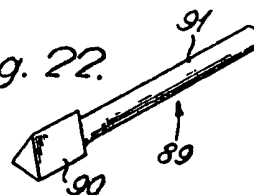


Fig. 22.



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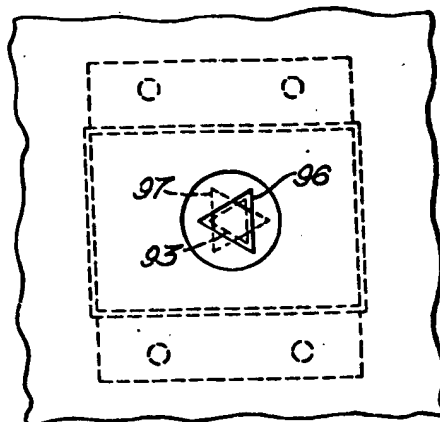
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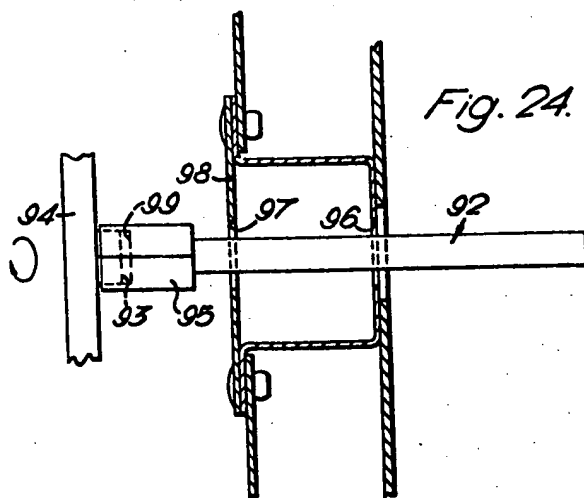
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*Fig. 23.*



*Fig. 24.*



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Fig. 25.

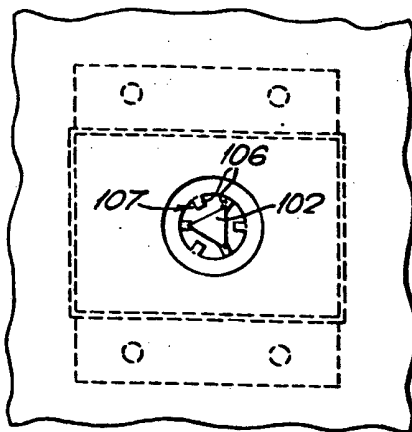
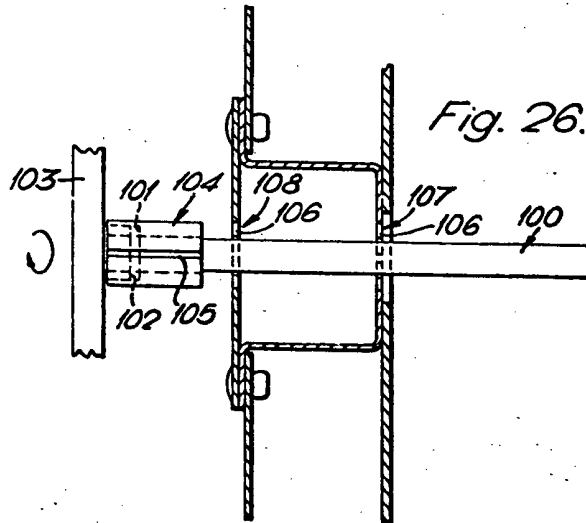


Fig. 26.



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